



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Jane A. Blasi et al.
Serial No. : 10/022,289
Filed : December 14, 2001
Title : ELECTROLYTE ADDITIVE FOR NON-AQUEOUS ELECTROCHEMICAL CELLS

Art Unit : 1745
Examiner : Dah-Wei D. Yuan

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF MICHAEL POZIN UNDER 37 C.F.R. § 1.132

I hereby swear:

1. I am an employee of The Gillette Company ("Gillette"), which owns the above-identified patent application. I have worked in the battery field for over 20 years.
2. I am a co-inventor on the above-identified patent application.
3. I have reviewed the above-identified patent application, which describes the following electrochemical cell:

Referring to Fig. 1, an electrochemical cell 10 includes an anode 12 in electrical contact with a negative lead 14, a cathode 16 in electrical contact with a positive lead 18, a separator 20 and an electrolytic solution. Anode 12, cathode 16, separator 20 and the electrolytic solution are contained within a case 22. The electrolytic solution includes a solvent system and a salt that is at least partially dissolved in the solvent system.

Cathode 16 includes an active cathode material, which is generally coated on the cathode current collector. The current collector is generally titanium, stainless steel, nickel, aluminum, or an aluminum alloy, e.g., aluminum foil. The active material can be, e.g., a metal oxide, halide, or chalcogenide; alternatively, the active material can be sulfur, an organosulfur polymer, or a conducting polymer. Specific examples include MnO_2 , V_2O_5 , CoF_3 , MoS_2 , FeS_2 , SOCl_2 , MoO_3 , S, $(\text{C}_6\text{H}_5\text{N})_n$, $(\text{S}_3\text{N}_2)_n$, where n is at least 2. The active material can also be a carbon

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monofluoride. An example is a compound having the formula CF_x , where x is 0.5 to 1.0. The active material can be mixed with a conductive material such as carbon and a binder such as polytetrafluoroethylene (PTFE). An example of a cathode is one that includes aluminum foil coated with MnO_2 . The cathode can be prepared as described in U.S. Patent No. 4,279,972.

Anode 12 can consist of an active anode material, usually in the form of an alkali metal, e.g., Li, Na, K, or an alkaline earth metal, e.g., Ca, Mg. The anode can also consist of alloys of alkali metals and alkaline earth metals or alloys of alkali metals and Al. The anode can be used with or without a substrate. The anode also can consist of an active anode material and a binder. In this case an active anode material can include carbon, graphite, an acetylenic mesophase carbon, coke, a metal oxide and/or a lithiated metal oxide. The binder can be, for example, PTFE. The active anode material and binder can be mixed to form a paste which can be applied to the substrate of anode 12.

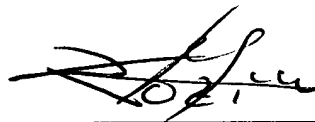
Separator 20 can be formed of any of the standard separator materials used in nonaqueous electrochemical cells. For example, separator 20 can be formed of polypropylene, (e.g., nonwoven polypropylene or microporous polypropylene), polyethylene, and/or a polysulfone.

The electrolyte can be in liquid, solid or gel (polymer) form. The electrolyte can contain an organic solvent such as propylene carbonate (PC), ethylene carbonate (EC), dimethoxyethane (DME), dioxolane (DO), tetrahydrofuran (THF), acetonitrile (CH_3CN), gamma-butyrolactone, diethyl carbonate (DEC), dimethyl carbonate (DMC), ethyl methyl carbonate (EMC) dimethylsulfoxide (DMSO) methyl acetate (MA), methyl formate (MF), sulfolane or combinations thereof. The electrolyte can alternatively contain an inorganic solvent such as SO_2 or $SOCl_2$. The electrolyte also contains a lithium salt such as lithium trifluoromethanesulfonate (LiTFS) or lithium trifluoromethanesulfonimide (LiTFSI), or a combination thereof. Additional lithium salts that can be included are listed in U.S. Patent No. 5,595,841, which is hereby incorporated by reference in its entirety. In some embodiments, the electrolyte may contain $LiPF_6$; in other embodiments, the electrolyte is essentially free of $LiPF_6$. The electrolyte also contains a perchlorate salt, which inhibits corrosion in the cell. Examples of suitable salts include lithium, barium, calcium, aluminum, sodium, potassium, magnesium, copper, zinc, ammonium, and tetrabutylammonium perchlorates. Generally, at least 500 ppm by weight of the perchlorate salt is used; this ensures that there is enough salt to suppress corrosion. In addition, less than about 20,000 by weight of the perchlorate salt is generally used. If too much perchlorate salt is used, the cell can be internally shorted under certain conditions during use. (Application, page 4, line 10 — page 5, line 22.)

When lithium perchlorate, lithium trifluoromethanesulfonate, lithium trifluoromethanesulfonimide, and/or lithium hexafluorophosphate are the only lithium and/or perchlorate salts that have been added to the electrolyte, the molarity of lithium ions in the electrolyte of this cell prior to discharge can be equal to the sum of the molarity of perchlorate ions in the electrolyte and the molarity of trifluoromethanesulfonate ions, trifluoromethanesulfonimide ions, or hexafluorophosphate ions in the electrolyte.

4. Additionally, several of the electrochemical cells in Example 1 of the above-identified patent application were prepared by adding a lithium perchlorate salt to an electrolyte that included a lithium trifluoromethanesulfonate salt. (See Application, page 6, line 8 — page 8, line 30.) After the addition of both the lithium trifluoromethanesulfonate salt and the lithium perchlorate salt into the electrolyte, and before discharge of the cell, the molarity of lithium ions in the electrolyte was equal to the sum of the molarity of perchlorate ions in the electrolyte and the molarity of trifluoromethanesulfonate ions in the electrolyte.

5. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that those statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.



Michael Pozin

08.08.05

Date